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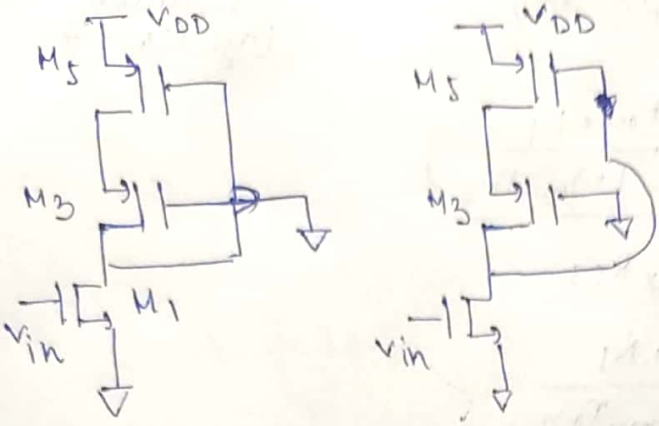
2. For differential mode, half circuit



$$R_{up} = \frac{r_{05} + r_{03}(1 + g_{m5} r_{05})}{1 + g_{m3} r_{03}(1 + g_{m5} r_{05})}$$ from previous

$$= \frac{r_{05} + \frac{r_{05}}{1 + g_{m5} r_{05}}}{g_{m3} r_{03} + \frac{1}{1 + g_{m5} r_{05}}} = \frac{r_{03} + r_{05} \| \frac{1}{g_{m5}}}{g_{m3} r_{03} + \frac{1}{1 + g_{m5} r_{05}}}$$

$$= \frac{r_{oy} + r_{o7} \| \frac{1}{g_{m7}}}{g_{my} r_{oy} + \frac{1}{1 + g_{m7} r_{o7}}}$$

$R_{down} = r_{ox}$

$G_m = g_{mx}$

$A_{dm} = -G_m R_{out} = -g_{mx}(R_{up} \| R_{down})$

$$= -g_{mx}\left(r_{ox} \| \frac{r_{oy} + r_{o7} \| \frac{1}{g_{m7}}}{g_{my} r_{oy} + \frac{1}{1 + g_{m7} r_{o7}}}\right)$$

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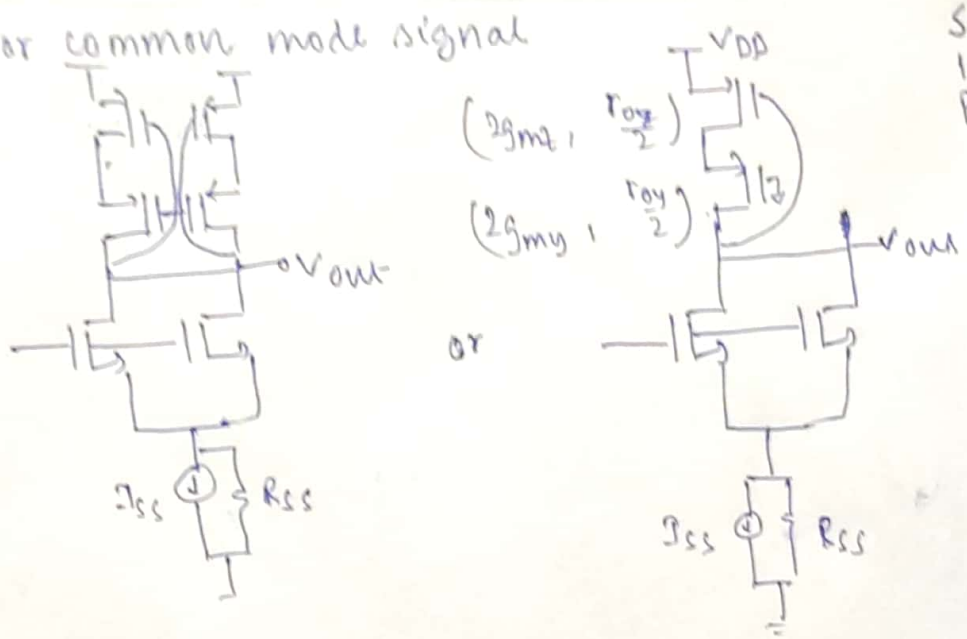
For common mode signal



$$R_{up} = \frac{1}{2}\left(\frac{r_{oy} + r_{oz} \,||\, \frac{1}{g_{mz}}}{g_{my} r_{oy} + \frac{1}{1 + g_{mz} r_{oz}}}\right)$$

$$R_{down} = \frac{r_{ox}}{2}$$

$$G_m = \frac{2g_{mx}}{1 + 2g_{mx} R_{SS}}$$

$$\therefore A_{cm} = -\frac{2g_{mx}}{1 + 2g_{mx} R_{SS}} \cdot \frac{1}{2}\left(\frac{r_{oy} + r_{oz} \,||\, \frac{1}{g_{mz}}}{g_{my} r_{oy} + \frac{1}{1 + g_{mz} r_{oz}}}\right) || \, r_{ox}$$

$$= \frac{r_{ox} \,||\, r_{oy} + r_{oz}}{}$$

$$= -\frac{\left(r_{ox} \,||\, \frac{r_{oy} + r_{oz} \,||\, \frac{1}{g_{mz}}}{g_{my} r_{oy} + \frac{1}{1 + g_{mz} r_{oz}}}\right)}{\frac{1}{g_{mx}} + 2R_{SS}}$$

$$= -\left(\frac{r_{oy} + r_{oz} \,||\, \frac{1}{g_{mz}}}{g_{my} r_{oy} + \frac{1}{1 + g_{mz} r_{oz}}}\right) || \, r_{ox} \times \frac{1}{\frac{1}{g_{mx}} + 2R_{SS}}$$

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